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"One other consequence which might be deduced from the existence of such errors is, that we must be very sceptical with regard to parallaxes deduced in the way in which it had been done by Capt. Jacob for *α Herculis;* most probably the parallax he has found in this case is nothing more than a strong indication that the positions observed by him are subject to similar systematic errors as mine: for in itself it is highly improbable that *α Herculis* and its companion should have different parallaxes. My researches on the constant errors of my observations are not yet closed, for there are yet many questions undecided. I shall continue them most probably throughout the whole ensuing summer, and only when they are finished I shall proceed to the publication of my fifteen years' observations of double stars."

On Two New Theorems in Lunar Astronomy. By Professor Challis.

(*Extract of a Letter from Professor Challis to the Editor.*)

"I have succeeded in demonstrating, on the principle of gravitation, two new theorems relating to the moon's orbit.

"Theorem I. All small quantities of the second order being taken into account, the relation between the radius vector and the time in the moon's orbit is the same as that in an orbit described by a body acted upon by a force tending to a fixed centre.

"If μ be the sum of the attractions of the earth and moon, and m' the attraction of the sun at the unit of distance, and if r be the moon's radius vector, and a' the sun's mean distance from the earth, the central force is $\frac{\mu}{r^2} - \frac{m' r}{2 a'^3}$. The theorem is true inclusive of the moon's motion in latitude.

"The integration by which the relation between the radius vector and the true longitude on the orbit is obtained, gives directly the mean motion of the apse to the first approximation. The same integration involves the following consequence:—

"Theorem II. The excentricity of the moon's orbit is a function of the ratio of the moon's periodic time to the earth's periodic time, and, to the first approximation, is equal to that ratio divided by the square root of 2.

"This theorem applies to the *constant* part of the excentricity, and depends entirely on the circumstance that the apse has a mean motion.

"The proofs of these theorems are contained in a communication to the Cambridge Philosophical Society.

"*Cambridge Observatory, March* 9, 1854."

An Account of the Hartwell Rectory Observatory.

By the Rev. C. Lowndes.*

"It might be thought that an Observatory on the Rectory grounds at Hartwell would be quite unnecessary, as Dr. Lee has

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* A model of this observatory has been sent to the apartments of the Society, which Dr. Lee explained at the last Meeting.

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such an excellent one so near, to which, out of pure love of and to advance the science, he has given me, and indeed all who take an interest in astronomy, free access. But, as in the spring of 1849, I had commenced taking meteorological observations for the British Meteorological Society, of which I have been a member from its formation, I was very anxious to have an observatory of my own, and decided upon building a very *small* one. My friend and neighbour, the Rev. J. B. Reade, mentioned my intention to Dr. Lee, when he very generously and kindly said, if I would build a larger one, he would give me all the materials. Such an offer I was only too glad to accept, and, accordingly, I set about the work of building a transit-room, intending, when circumstances would allow, to add an equatoreal-room. A committee was formed at Dr. Lee's suggestion, consisting of himself, the Rev. J. B. Reade, and T. Dell, Esq., to fix upon a site, and to superintend the work.

" The site is the best, under the circumstances, which could be chosen, and commands the passage of *Fomalhaut* to the south. As no distant object can be seen, and there are no meridian marks, I am compelled to adjust the collimation by the passage of *Polaris*, and thus obtain the error.

" *The transit-room* is substantially built of *brick*, upon a *solid bed of concrete*, and is 10 feet square in the clear, and 8 feet 9 inches high, the top being covered with lead and the two shutters with copper. The floor is supported by joists, forming square frames round the transit and clock-piers, so that no tremor can be communicated by the planks; and the clock and two transit-piers are also placed upon *solid beds of concrete*, independent of the walls of the building. The two piers supporting the transit instrument are of *Caen stone*, 4 feet 11 inches above the floor.

" The transit instrument was made by Mr. T. Slater, optician, No. 4 Somers Place West, New North Road, London, and is supported upon brass Y's by two cones, which form an axis of 2 feet 5 inches in length, the pivots which rest in the Y's being made of bell-metal 1¾ inches in diameter. Two adjustments are attached to the Y's, the one on the west pier for making the axis horizontal, the other on the east pier for adjusting the telescope in azimuth. The telescope is 5 feet 7 inches in length, having an object-glass, whose aperture is 4¼ inches in diameter. There are five fine vertical wires and six thicker ones, for taking faint objects, placed in the principal focus, the intervals by *Polaris* of the five fine wires being $10^m 44^s$. The *setting circles* are fixed at the eye-end of the telescope; they are 6 inches in diameter, and are divided on silver. There is also a dew-cap fixed at the object-end, made of zinc, densely blackened within.

" The *level* used for adjusting the horizontal position of the axis of the transit instrument was also made by Mr. T. Slater; the value of each division is one second in space.

" *The clock*, which is placed in the south-west corner of the building, was made expressly for me by Mr. Dent; and a very excellent one it has proved. It has a compensating pendulum, and

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a particularly good beat, and keeps an equitable losing rate; the variation on its rate being (invariably) less than one-hundredth of a second. It has a tendency to gain this quantity in the cold weather, and to lose it in the warm weather."

The foregoing description was accompanied by an account of the meteorological department of the Observatory and a detailed statement of the expenses connected with the undertaking. The following is the recapitulation on the latter head:—

	£	s.	d.
Cost of the building	55	0	9
Cost of astronomical instruments	138	10	0
Cost of meteorological instruments	17	2	0
Total	210	12	9

The paper also contained a few transits taken by Mr. Lowndes, at his Observatory; and a few similar observations made at the Observatory of Hartwell House by Dr. Lee's Assistant. The results for the several wires are very accordant in both cases.

Remarkable Appearance of the Shadow of Saturn projected on the Ring. By J. Hippisley, Esq.

"I observed *Saturn* near, and on the meridian, with a Newtonian equatoreal of 9¼-inch aperture, powers 360 and 462. The atmosphere afforded conditions of very unusual definition. I perceived distinctly a faint line or belt on the outer ring, at about three-fifths of its breadth from the inner edge. This line did not at all give the impression of a *division;* but as compared with the tint of the main separation of the rings, was, though of sensible breadth, of a much paler and fainter shade. Having on a previous occasion of similar, but equally rare, atmospheric tranquillity, had the advantage of viewing *Saturn* with Mr. Lassell's 20-foot telescope, and recalling some other circumstances of even superior definition with which the planet, as to its other features, was then seen, I feel assured that the outer ring was not at that time marked by any similar belt or line; and that those markings are therefore of a variable character.

"But the most remarkable feature was the shape and position of the shadow of the ball. This was conspicuously curvilinear, with the convexity towards the ball; and of such curvature that the curve produced ought to have passed over a considerable portion of the outer ring, if that ring had been in the same plane with the inner. It did not, however, visibly touch the outer ring at all; which retained its brightness unshaded up to the point at which it was occulted by the vertex of the ball; affording, it might seem, evidence that the plane of the outer ring was sensibly raised, at that side, above the edge of the inner: moreover, the impression derived from the shape of the shadow was that the surface of the inner ring was convex, and perceptibly thicker at the middle than at either of its edges.